Claims

What is claimed is:

1. A method of controlling a motor, comprising:

generating a square waveform command signal for controlling the operation of the motor based on a square waveform, wherein the square waveform comprises an acceleration phase immediately followed by a deceleration phase;

shaping the square waveform command signal using (1-cosine)/2 shaping to thereby generate a shaped waveform command signal;

generating a control signal based on the shaped waveform command signal; and

outputting the control signal to the motor.

2. The method of claim 1, wherein generating the square waveform command signal includes:

determining a seek length;

determining an acceleration; and

generating the square waveform command signal based on the seek length and acceleration.

3. The method of claim 2, wherein determining the acceleration includes:

determining an optimum slope for the square waveform;

determining an approximate acceleration based on the optimum slope;

determining a sample count based on the seek length and approximate acceleration; and

calculating the acceleration based on the seek length and sample count.

4. The method of claim 1, further comprising:

generating a plant adjustment signal;

summing the plant adjustment signal with the control signal to generate a resultant signal; and

outputting the resultant signal to the voice coil motor to thereby control the voice coil motor.

5. The method of claim 1, wherein generating the control signal includes:

determining at least one of a reference position and a reference velocity;

determining at least one of an actual position and an estimated velocity;

determining at least one of a position error and a velocity error based on the reference position, reference velocity, actual position and estimated velocity;

generating a correction signal based on one of the position error and the velocity error; and

adding the correction signal to the shaped waveform command signal to thereby generate the control signal.

6. The method of claim 3, wherein the approximate acceleration is determined using the following equation:

A = Minimum_A + (slope*minimum(SeekLength, Maximum SeekLength)

where A is the approximate acceleration, Minimum_A is a minimum acceleration value for the seek operation, slope is the determined optimum slope, SeekLength is the determined seek length for the seek operation, and Maximum SeekLength is a maximum seek length for the seek operation.

7. The method of claim 3, wherein the sample count is determined based on the following equation:

sample_count = truncated(sqrt(SeekLength/ A))

where sample_count is the sample count, SeekLength is the determined seek length, and A is the approximate acceleration.

8. The method of claim 1, wherein generating the control signal is performed without using low-pass filtering.

9. The method of claim 5, wherein the reference position and reference velocity are determined by applying the shaped waveform command signal to a model that approximates the operation of the voice coil motor.

10. The method of claim 1, wherein the motor is a voice coil motor, and the method is for a seek operation in a storage device.

11. An apparatus for controlling a motor, comprising:

a feedforward device; and

a controller coupled to the feedforward device, wherein the feedforward device generates a square waveform command signal for controlling the operation of the motor based on a square waveform, wherein the square waveform comprises an acceleration phase immediately followed by a deceleration phase, and shapes the square

waveform command signal using (1-cosine)/2 shaping to thereby generate a shaped waveform command signal, and wherein

the controller generates a control signal based on the shaped waveform command signal and outputs the control signal to the motor.

12. The apparatus of claim 11, wherein the feedforward device generates the square waveform command signal by:

determining a seek length;

determining an acceleration; and

generating the square waveform command signal based on the seek length and acceleration.

13. The apparatus of claim 12, wherein the feedforward device determines the acceleration by:

determining an optimum slope for the square waveform;

determining an approximate acceleration based on the optimum slope;

determining a sample count based on the seek length and approximate acceleration; and

calculating the acceleration based on the seek length and sample count.

14. The apparatus of claim 11, further comprising:

a plant adjustment device that generates a plant adjustment signal based on the shaped waveform command signal; and

a summation device that adds the plant adjustment signal to the control signal to generate a resultant signal, wherein the resultant signal is output to the voice coil motor to thereby control the voice coil motor.

15. The apparatus of claim 11, further comprising:

a plant model that determines a reference position of a read/write head; and

a measurement device for measuring an actual position of the read/write head, wherein the controller determines a position error based on the reference position and the actual position, generates a correction signal based on one of the position error, and adds the correction signal to the shaped waveform command signal to thereby generate the control signal.

16. The apparatus of claim 13, wherein the feedforward device determines the approximate acceleration using the following equation:

A = Minimum_A + (slope*minimum(SeekLength, Maximum SeekLength)

where A is the approximate acceleration, Minimum_A is a minimum acceleration value for the seek operation, slope is the determined optimum slope, SeekLength is the determined seek length for the seek operation, and Maximum SeekLength is a maximum seek length for the seek operation.

17. The apparatus of claim 13, wherein the feedforward device determines the sample count based on the following equation:

sample_count = truncated(sqrt(SeekLength/A))

where sample_count is the sample count, SeekLength is the determined seek length, and A is the approximate acceleration.

18. The apparatus of claim 11, wherein the controller generates the control signal without using low-pass filtering.

19. The apparatus of claim 15, wherein the reference position is determined by applying the shaped waveform command signal to a model that approximates the operation of the voice coil motor.

20. The apparatus of claim 11, wherein the motor is a voice coil motor, and the method is for a seek operation in a storage device.